CURRENT LITERATURE

NOTES FOR STUDENTS

Distribution of Pinus Banksiana and Thuja occidentalis.—In a recent issue of this journal HUTCHINSON[1] has discussed the limiting factors controlling the distribution of forest trees in northern Canada. Most of his points seem to have been well taken, and his conclusions in accord with the observed facts. He lays considerable emphasis on certain peculiarities in the distribution of *Pinus Banksiana* and *Thuja occidentalis*. The latter he regards as having migrated from a limited central area so slowly that it has not reached its ecological limits; while the former has had its extent modified by competition, which it seems less able to resist than severe conditions in its environment.

More recently FERNALD[2] has offered another explanation for the irregularities of these two trees, and has criticized HUTCHINSON'S article in a decidedly unsympathetic manner. He comments upon the accidental use of *Abies canadensis* in the legend of a map when it is quite evident from the text that *Abies balsamea* is intended (this correction was made by the author in the errata published in the June number of the BOTANICAL GAZETTE). He also points out certain minor omissions and irregularities which somewhat modify HUTCHINSON'S limits of various species. His main point, however, is to offer an entirely different explanation for the peculiarities in the range of the two trees just mentioned. From data obtained chiefly from the reports of the Geological Survey of Canada, he shows that *Pinus Banksiana* is found principally on sands, acid rocks, and in acid swamps. This seems to support his contention that the "Banksiana pine is a pronounced oxylophyte." The evidence presented is such that it seems at least entirely probable that the limiting factor in the distribution of this tree may be largely one of soil. This is rather strengthened by the records of certain of its outposts in southeastern Minnesota[3] upon sandy soil. It does not seem, however, that the fact that *Pinus Banksiana* is to be regarded as a tree of acid habitats invalidates HUTCHINSON'S conclusion that it is limited in many parts of its range by competition.

FERNALD seems also to make a good case for *Thuja* being confined in its best development and in many of its outlying stations to calcareous areas. The failure of *Thuja* to reach Newfoundland would be due, as he contends, to

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[1] BOT. GAZ. **66**:465–493. 1919.

[2] FERNALD, M. L., Lithological factors limiting the ranges of *Pinus Banksiana* and *Thuja occidentalis*. Rhodora **21**:41–67. 1919.

[3] ROSENDAHL, C. O., and BUTTERS, F. K., On the occurrence of *Pinus Banksiana* in southeastern Minnesota. Plant World **21**:107–113. 1918.

the barrier of siliceous rock upon the adjacent mainland. His view that "the Canadian cedar swamp is, then, a phase of WARMING'S calcareous low-moore" appears less probable, and does not seem to explain the frequent presence of *Thuja* in associations with *Larix* in bogs.

It would seem to remain for some one possessing intimate knowledge of the northern forests, but without prejudice for or against the chemical theory of soil control, to harmonize such opposing views as those of HUTCHINSON and FERNALD, by showing that each contributes to the solution of a complex problem, and that the truth lies at neither extreme.—GEO. D. FULLER.

Hybrid vigor.—This subject is brought up to date and ably discussed by JONES[4] in the publication of his latest experiments with corn. The author has continued the inbreeding experiments started by EAST and HAYES. As was predicted, the inbred strains have now reached a condition of almost complete homozygosity, so that further inbreeding no longer brings decrease in vigor, and crossing within the strain brings no increase. The author amplifies somewhat his previously published[5] interpretation of hybrid vigor on the basis of dominance of linked factors.

In addition to the main thesis, some very interesting by-products are discussed. As a practical method of utilizing hybrid vigor in corn, SHULL[6] and others have advised isolating strains A and B and using for seed corn every generation the F_1 grains produced by $A \times B$. A disadvantage of this method lies in the fact that these seeds are usually small, for, although they contain an F_1 embryo, the amount of endosperm is that of the maternal parent (from an inbred, "non-vigorous" race, A or B). Since these seeds are small, the F_1 individuals get a poor start, limiting their expression of hybrid vigor. To overcome this difficulty JONES proposes an intelligent use of 4 selected strains thus: $A \times B$ giving AB; $C \times D$ giving CD; $AB \times CD$ giving the seed corn to be used, which will have sufficient endosperm for a good start and will display hybrid vigor as well.

Carrying further his experiment[7] with mixed foreign and own pollen ("yellow" and "white" pollen), JONES attempted to discover whether there was any selective fertilization in favor of the foreign pollen; this might have been expected from the advantages which foreign pollen brought, as well as from the well-known behavior in self-sterile races. The results, however, pointed consistently in the opposite direction; own pollen was slightly but

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[4] JONES, D. F., The effects of breeding and cross-breeding upon development. Conn. Exper. Sta. Bull. 207. pp. 100. *pls.* 12. 1918.

[5] BOT. GAZ. **56**:70–72. 1918.

[6] SHULL, G. H., Hybridization methods in corn breeding. Amer. Breeders Mag. **1**:98–107. 1910.

[7] JONES, D. F., Bearing of heterosis upon double fertilization. BOT. GAZ. **65**:324–333. *figs.* 3. 1918.